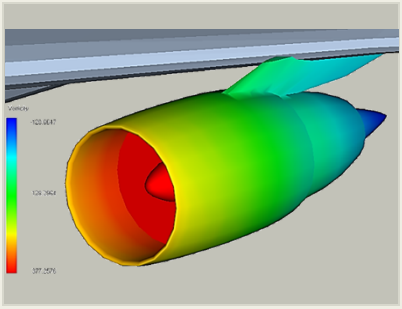
Advanced Aerodynamic Analysis For Propulsion Airframe Integration, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Research in Flight is proposing to develop a fundamentally new, lower order, high fidelity solution approach for the aerodynamic analysis required for engine integration studies. This new approach is based on a new tool known as Flightstream. Flightstream is a surface vorticity based solver which uses an unstructured surface geometry, and a correlation for skin friction which is based on the surface vorticity. For lift and induced drag calculations, Fligthstream makes use of the Kutta Joukowski Theorem. The Kutta Joukowski Theorem has proven to be a remarkably accurate method for calculating loads for essentially all lifting configurations in which the flow is attached to the surface. Research in Flight has demonstrated many compelling capabilities of Flightstream to accurately predict the aerodynamic loads on a range of geometries including high lift configurations. This fundamentally new approach to aircraft outer mold line evaluation offers the speed and fidelity required for even optimization based design. The speed of Flightstream is comparable to traditional panel approaches yet the fidelity in calculating loads has been shown to be comparable to high fidelity CFD solutions. To further compliment the utility of FLightstream as a compelling design tool, Flightstream has been configured to operate seamlessly with NASA's Vehicle Sketch Pad (VSP) software. The primary function of the proposed activity will be to develop an automated approach to engine integration by coupling the compelling capabilities of Flightstream with optimization tools, rudimentary engine performance tools, and automated grid generation using VSP. The goals for the optimization will be related to aerodynamic performance and will include lift to drag and moment calculations in consultation with the technical point of contact at NASA. A report on the progress during Phase I will outline the process and will include preliminary results.



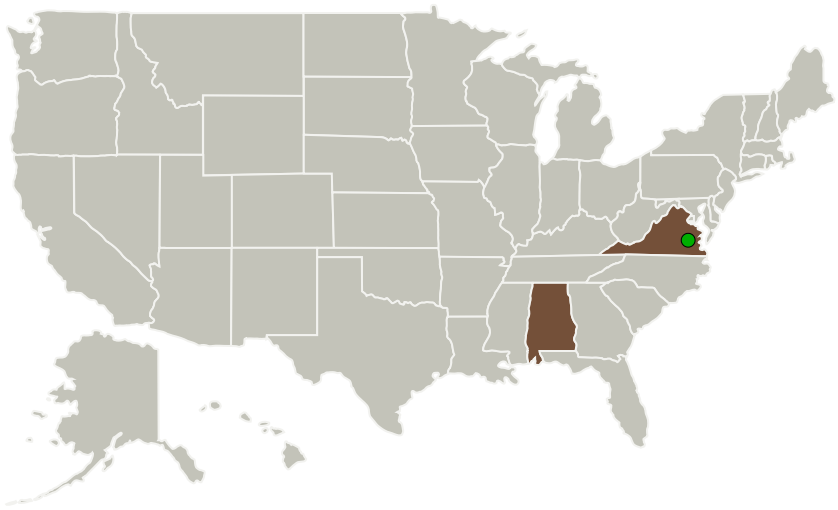
Advanced Aerodynamic Analysis For Propulsion Airframe Integration, Phase I

Table of Contents

Advanced Aerodynamic Analysis For Propulsion Airframe Integration, Phase I

Completed Technology Project (2015 - 2015)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Research in Flight	Lead Organization	Industry	Auburn, Alabama
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Advanced Aerodynamic Analysis For Propulsion Airframe I ntegration, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138778)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Research in Flight

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

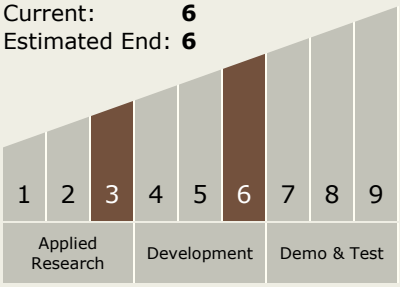
Carlos Torrez

Principal Investigator:

John Burkhalter

Technology Maturity (TRL)

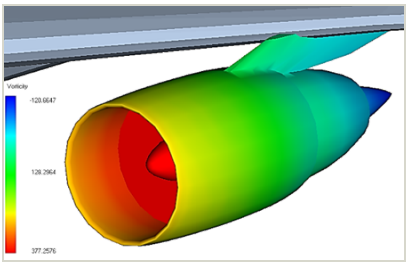
Start: **3**
Current: **6**
Estimated End: **6**



Advanced Aerodynamic Analysis For Propulsion Airframe Integration, Phase I

Completed Technology Project (2015 - 2015)

Images



Briefing Chart Image
Advanced Aerodynamic Analysis For Propulsion Airframe Integration, Phase I
(https://techport.nasa.gov/image/129061)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.1 Aerodynamics

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System